

dCache SRM

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dCache/SRM design meeting, December 2005 Fermilab



Storage Resource Managers



— [SRMs are middleware components that manage shared storage resources on the Grid and provide:

- Uniform access to heterogeneous storage
- File Transfer Protocol negotiation
- Dynamic Transfer URL allocation
- Access to permanent and temporary types of storage
- Advanced space and file reservation

— [Reliable transfer services



Storage Resource Manager versions



— [Two SRM Interface specifications

- SRM v1.1 provides
 - Data access/transfer
 - Implicit space reservation
- SRM v2.1 adds
 - Explicit space reservation
 - Namespace discovery and manipulation
 - Access permissions manipulation

— [Fermilab SRM implements SRM v1.1 specification

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SRM Protocols and Groups of Functions



[SRM interface consists of the following groups of functions:

- Space Management Functions – v2.1
- Data Transfer Functions – v1.1 and v2.1
- Directory Functions – v2.1
- Permission Functions – v2.1
- Status Functions – v1.1 and v2.1



SRM V1 Interface Details



Data Transfer Functions:

Get

Put

Copy

getRequestStatus

getFileMetaData

setFileStatus

Remaining Functions:

Pin

Unpin

getProtocols

getEstGetTime

getEstPutTime

AdvisoryDelete



SRM V2 Interface Details



Space Management Functions

SrmReserveSpace
SrmReleaseSpace
srmUpdateSpace
srmCompactSpace
srmGetSpaceMetaData
srmChangeFileStorageType
srmGetSpaceToken

Directory Functions

SrmMkdir
srmRmdir
srmRm
srmLs
srmMv

Data transfer functions

srmPrepareToGet
SrmPrepareToPut
srmCopy
SrmRemoveFiles
srmReleaseFiles
srmPutDone
srmAbortRequest
srmAbortFiles
srmSuspendRequest
srmResumeRequest

Status Functions

srmStatusOfGetRequest
srmStatusOfPutRequest
srmStatusOfCopyRequest
srmGetRequestSummary
srmExtendFileLifeTime
SrmGetRequestID

Permission

srmSetPermission
srmReassignToUser
srmCheckPermission



Srmcp Client Server Negotiation(1)



[Srmcp reads/writes a file(s)

- 1.srmcp issues get/put, gets request id back
- 2.while request status is “Pending”, update request status
- 3.once status is ready and TURL(s) is available perform transfer from/to TURL(s)
- 4.once transfer completes, set file status to “Done”



Srmcp Client Server Negotiation(2)



— [Srmcp copies a file from one SRM server to another

1.srmcp issues copy, gets request id back

2.while request status is “Pending”, update request status

3.once status is “Done” transfer has completed, report result and exit.



SRM to dCache communication



SRM Server

SRM Client

Srmcp

Srmcp issues a request as soap message over gsi ssl socket

SRM Web Service Server, receives and interprets soap messages

Authorization and Authentication

Srm Request is created

Request Scheduler, queues and executes request, retries in case of failures

AbstractStorageElement Interface, abstraction of General Storage Operations

dCache specific implementation of AbstractStorageElement, translates srm requests into dCache specific operations

Underlying Storage

dCache

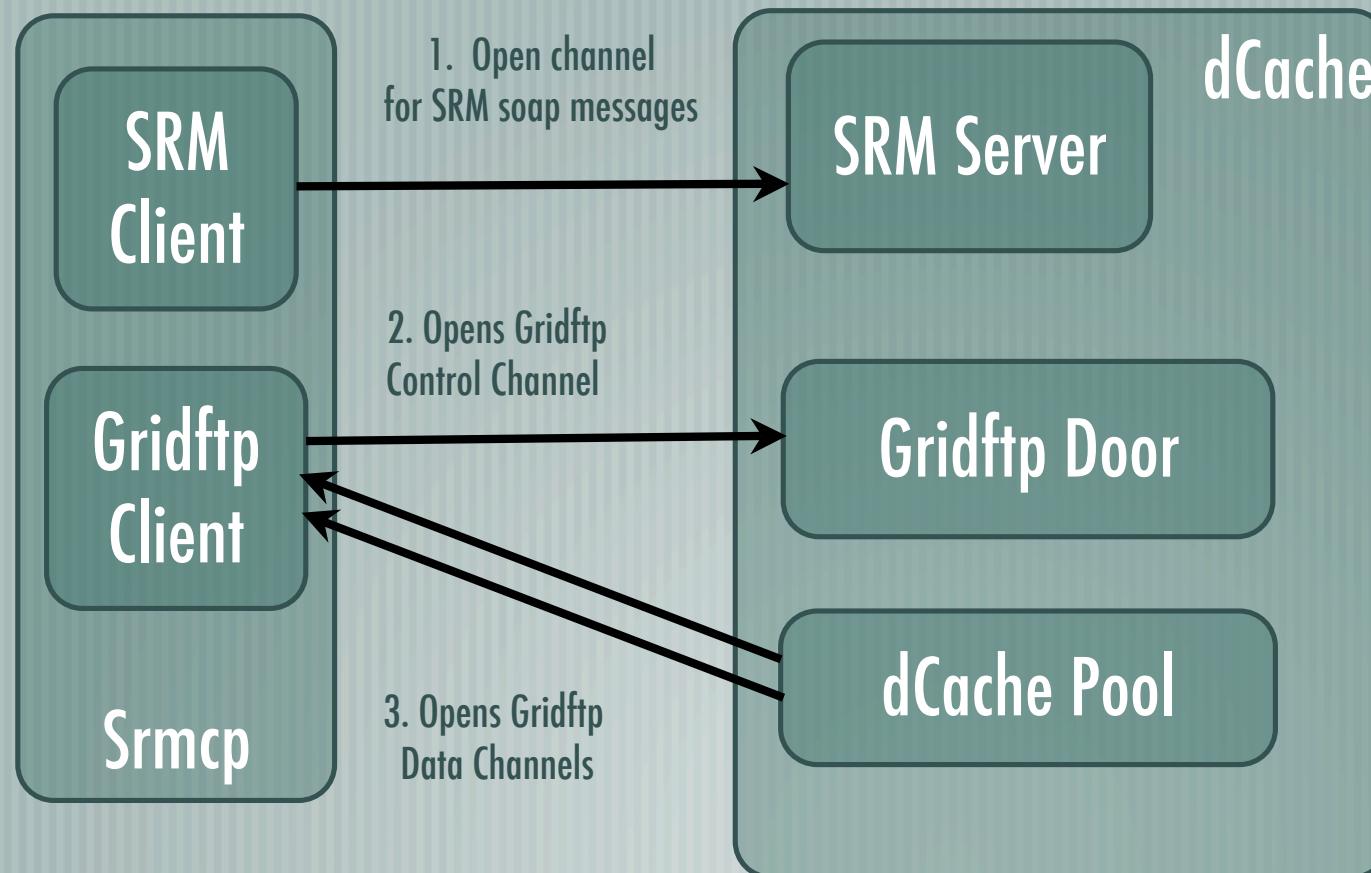
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SRM Get Network Flows



srmcp srm://dCache:8443/dir1/file1 file:///tmp/file1



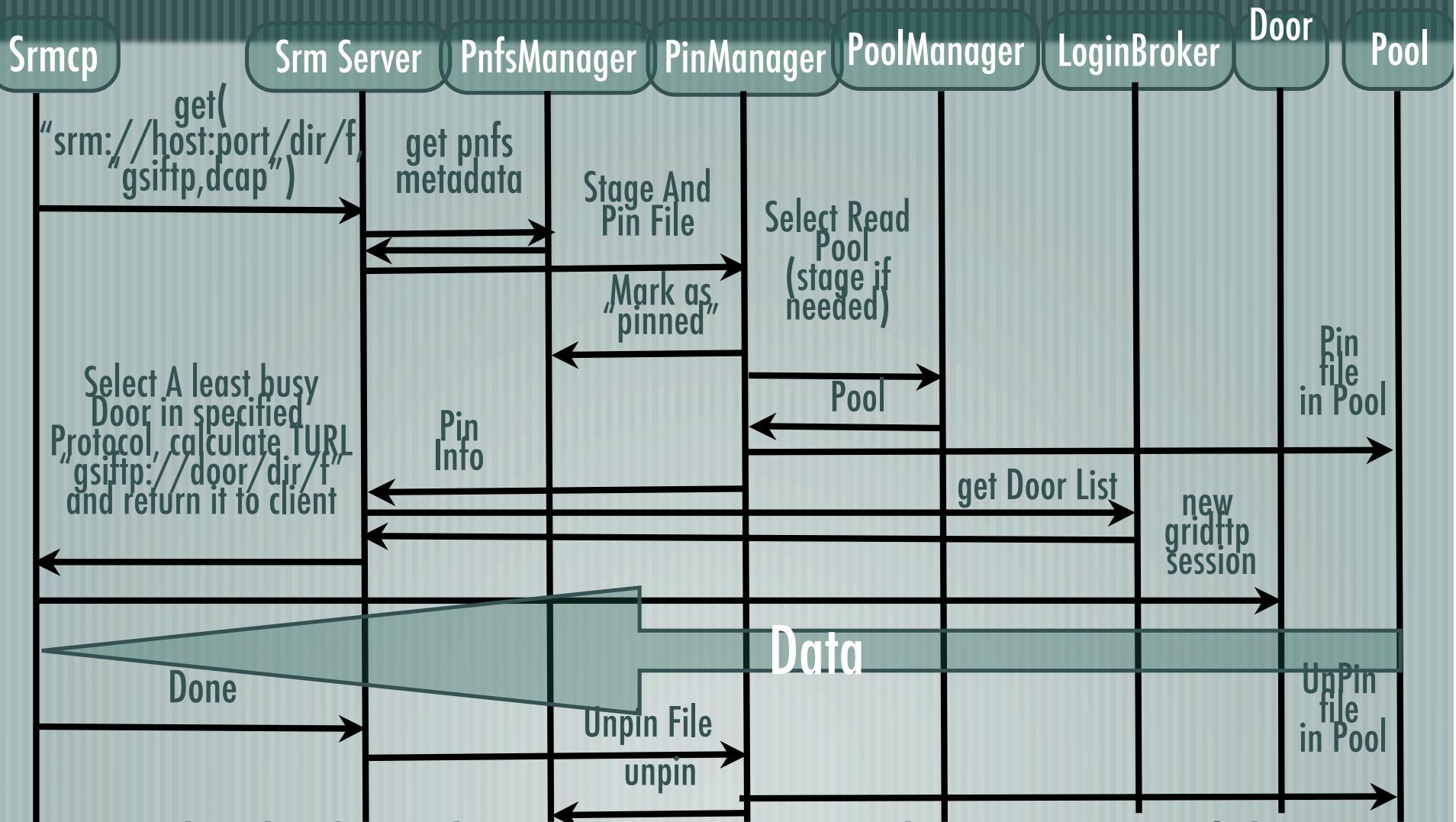
Firewalls:

- Srmcp Client port range needs to be open and configured when behind a Firewall
- Pools can be behind firewall
- Srm server port must be open on srm node
- Gridftp server port must open on Gridftp door

Configuration details at
http://www.dcache.org/manuals/experts_docs/firewall.html



SRM Get Details

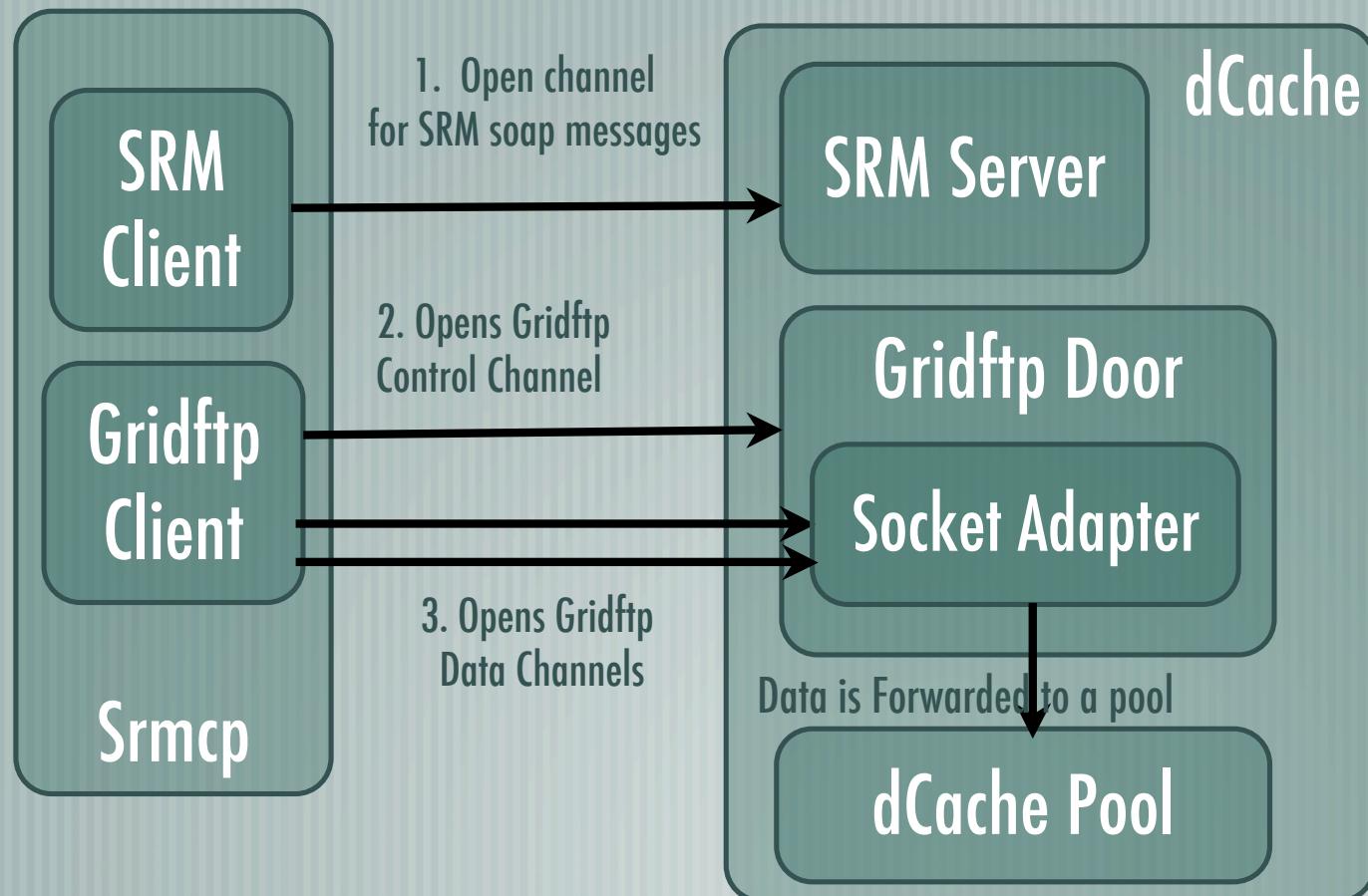




SRM Put Network Flows



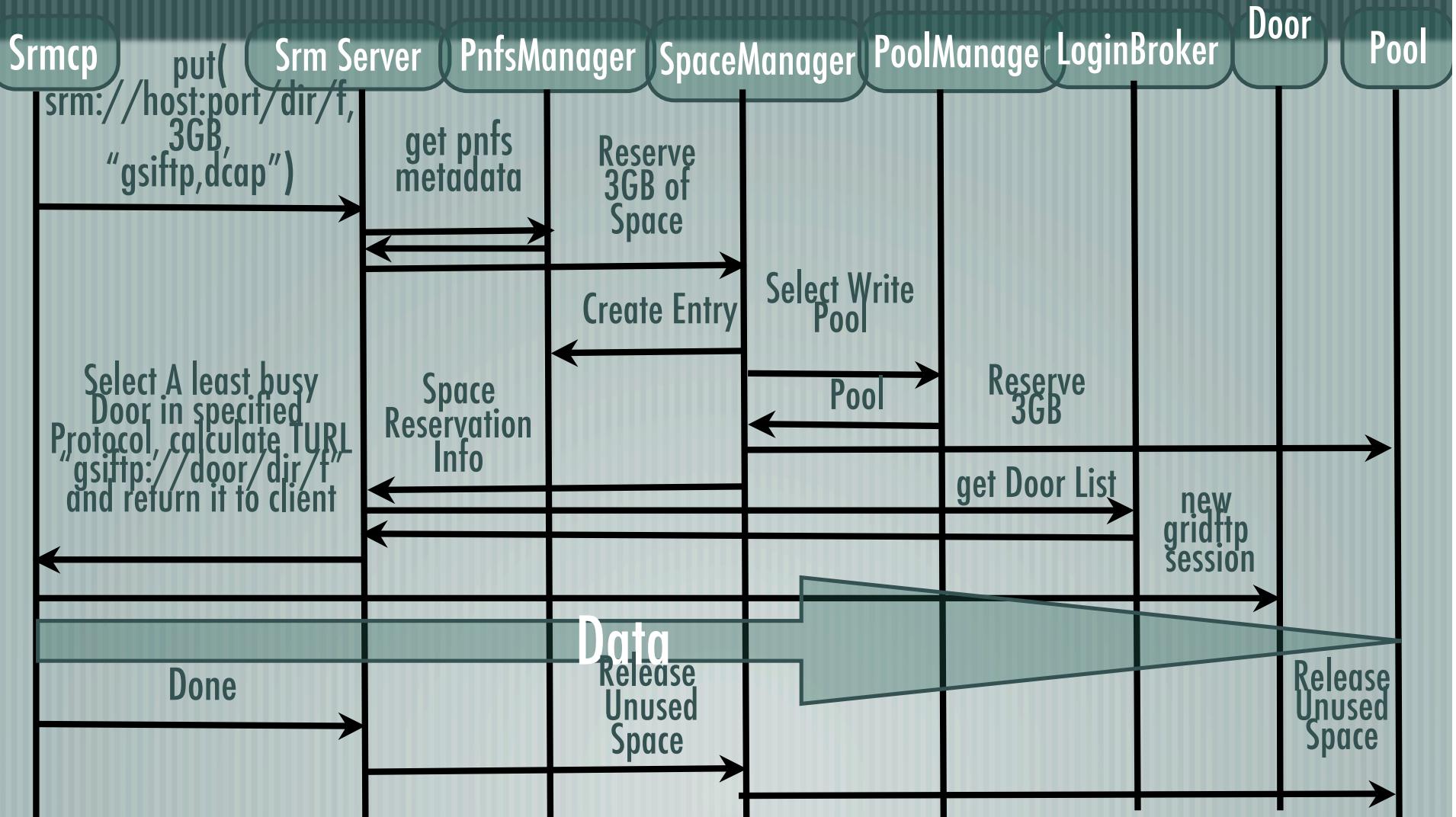
srmcp file:///tmp/file1 srm://dCache:8443/dir1/file1 Firewalls:



- Srmcp Client can be behind a Firewall
 - Pools can be behind firewall
 - Srm server port must be open on srm node
 - Gridftp port and port range for data must be configured on Gridftp door
- Configuration details at
http://www.dcache.org/manuals/experts_docs/firewall.html



SRM Put Details

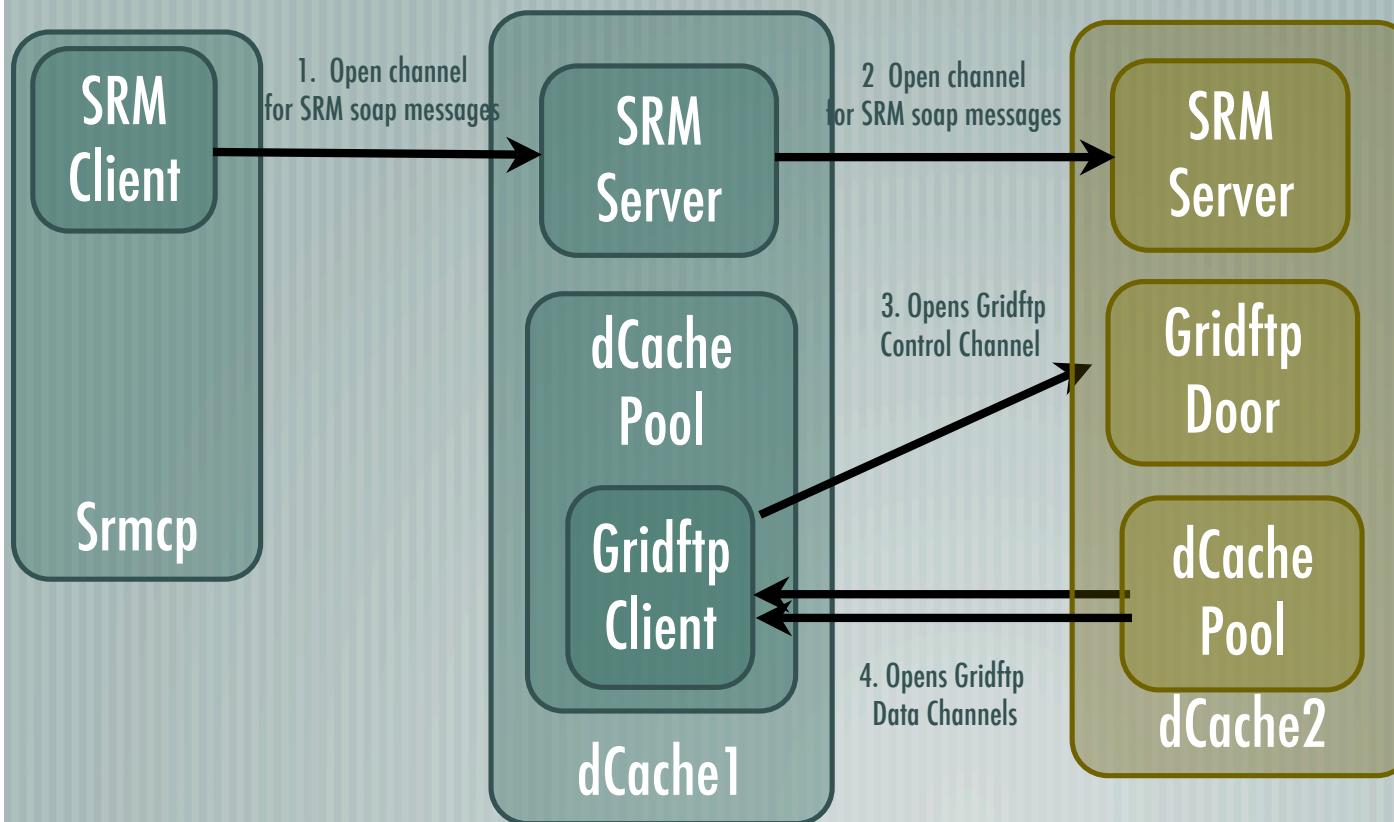




SRM Copy in Pull Mode Network Flows

srmcp srm://dCache2:8443/dir1/file1
srm://dCache1:8443/dir1/file1.copy

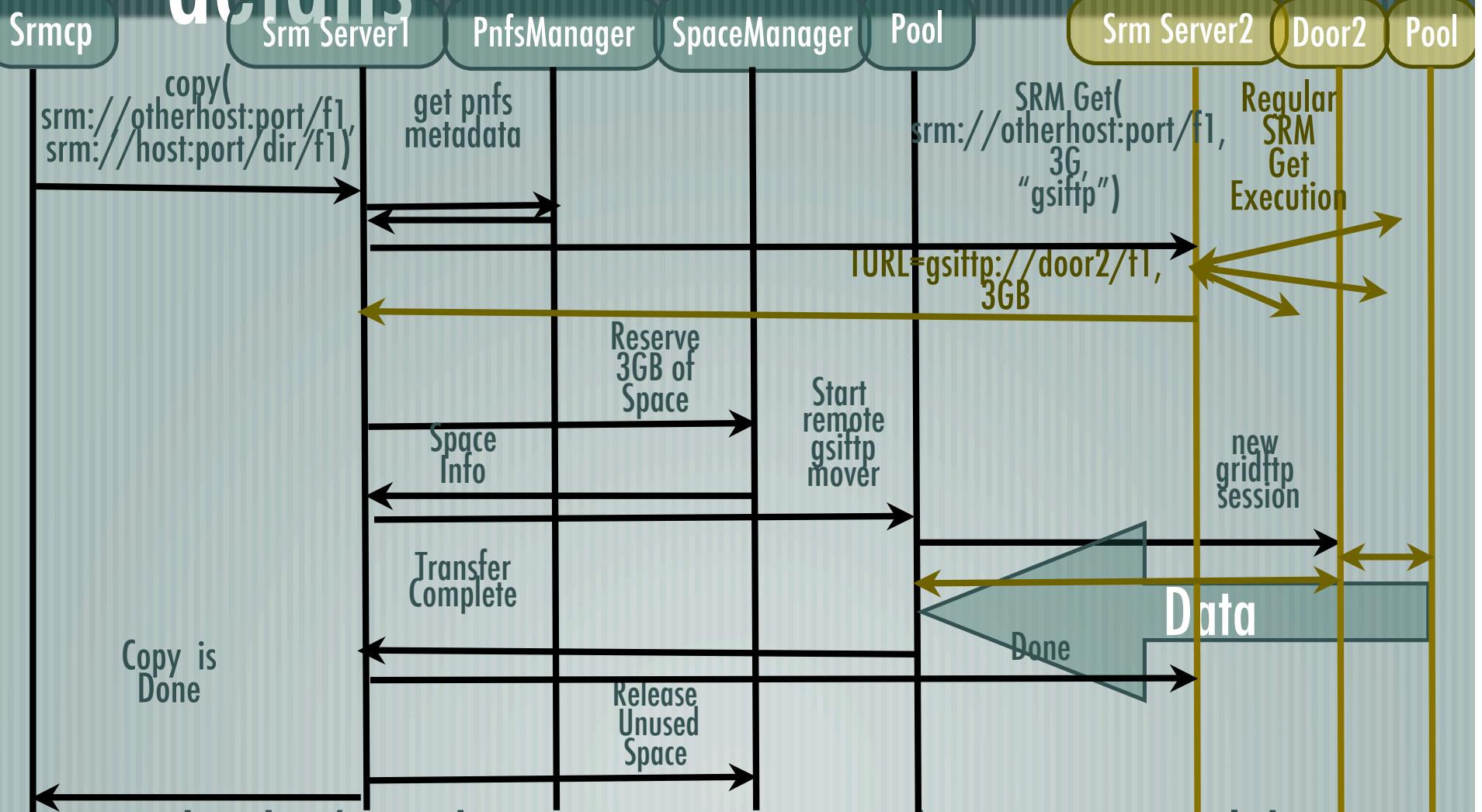
Firewalls:



- Srmcp Client can be behind a Firewall
- dCache1 Pools need a port range set up and configured
- Srm servers ports must be open on srm nodes
- dCache2 Gridftp server port must be open on Gridftp door node

Configuration details at
http://www.dcache.org/manuals/experts_docs/firewall.html

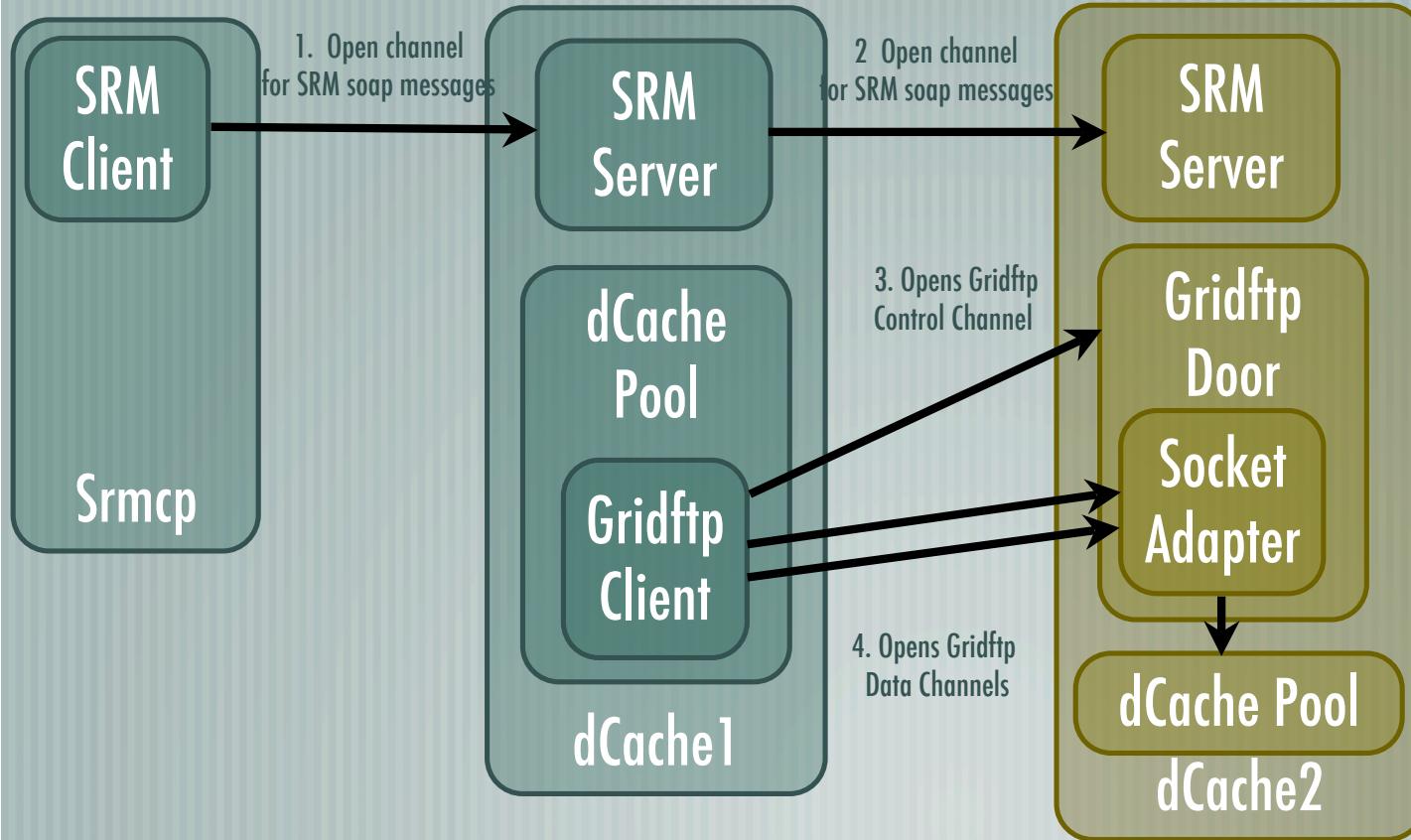
SRM Copy in pull mode details





SRM Copy in Push Mode Network Flows

```
srmcp -pushmode srm://dCache1:8443/dir1/file1  
srm://dCache2:8443/dir1/file1.copy
```



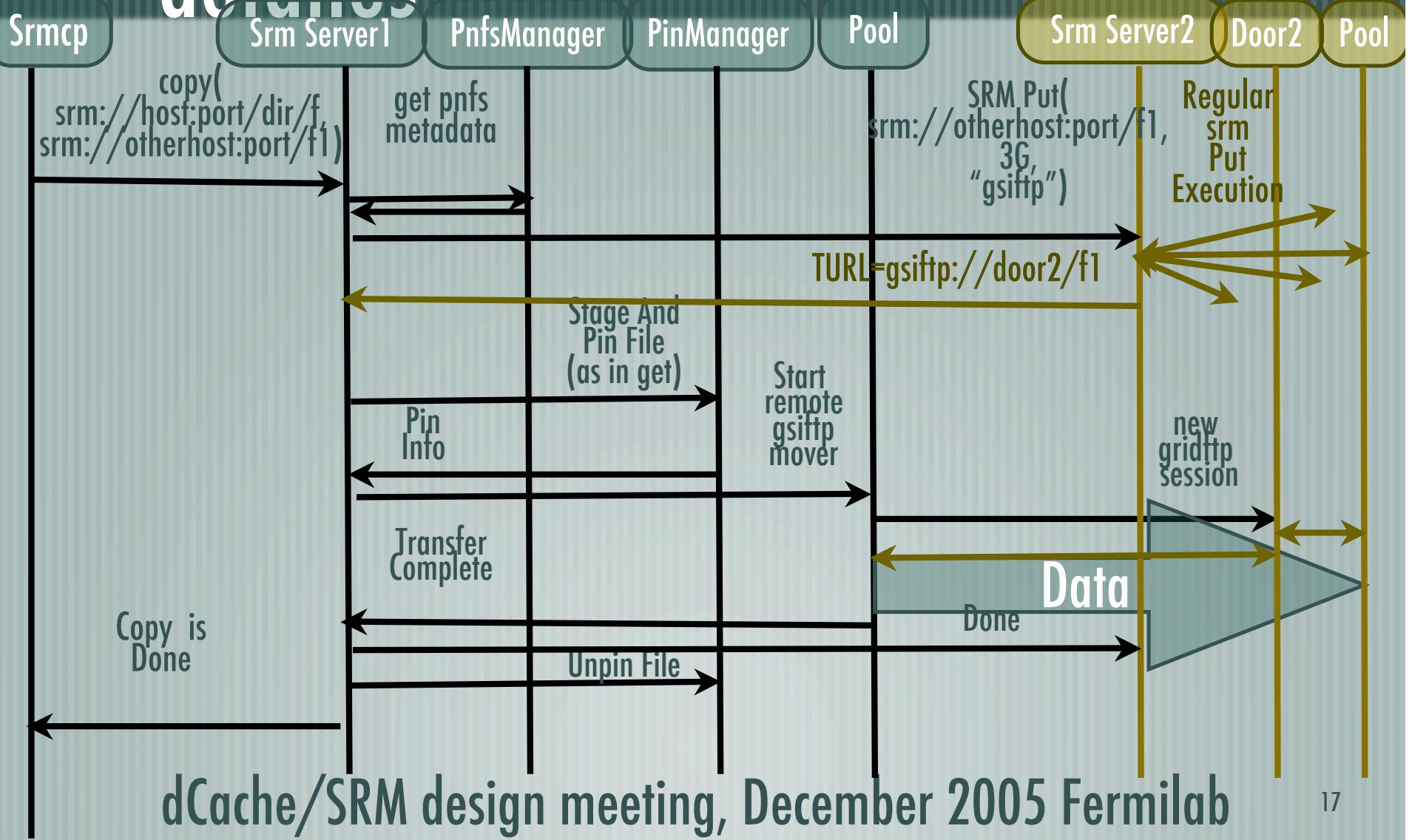
Firewalls:

- Srmcp Client can be behind a Firewall
- dCache1 Pools and dCache2 Pools can be behind firewalls
- Srm servers ports must be open on srm nodes
- dCache2 Gridftp server must have a port range open and configured port must be open on Gridftp door node

Configuration details at
http://www.dcache.org/manuals/experts_docs/firewall.html

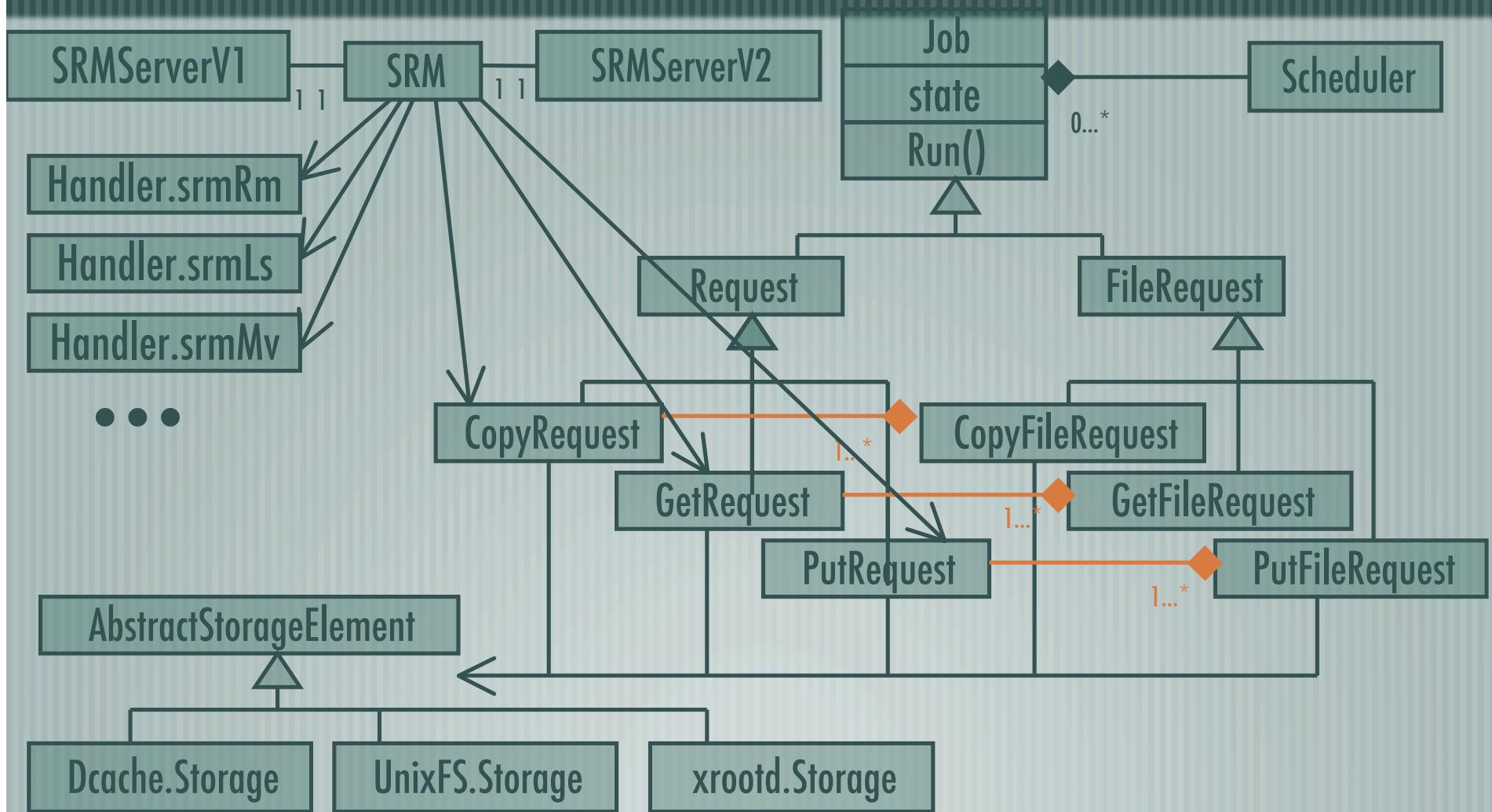


SRM Copy in push mode details

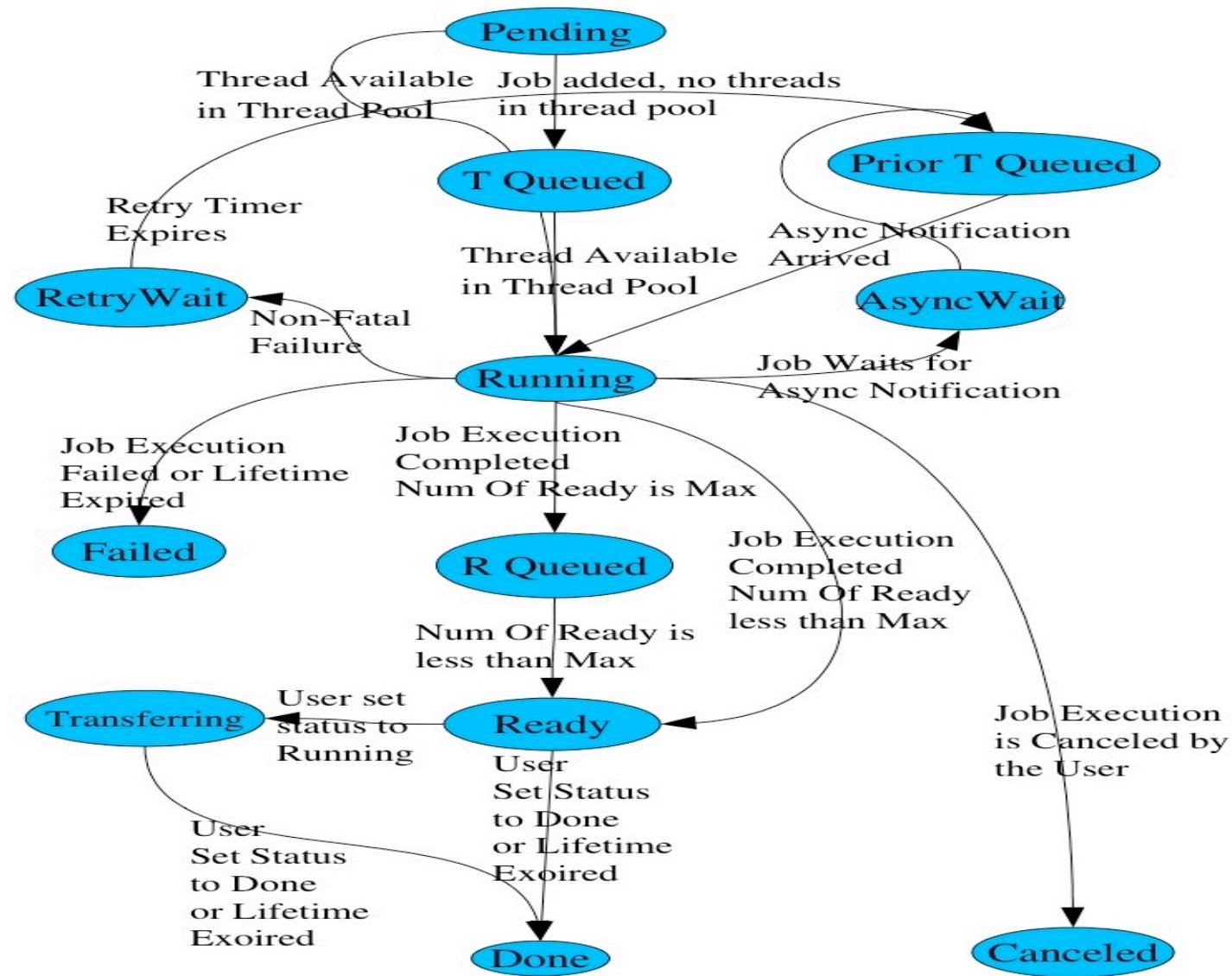




SRM Class Diagram.

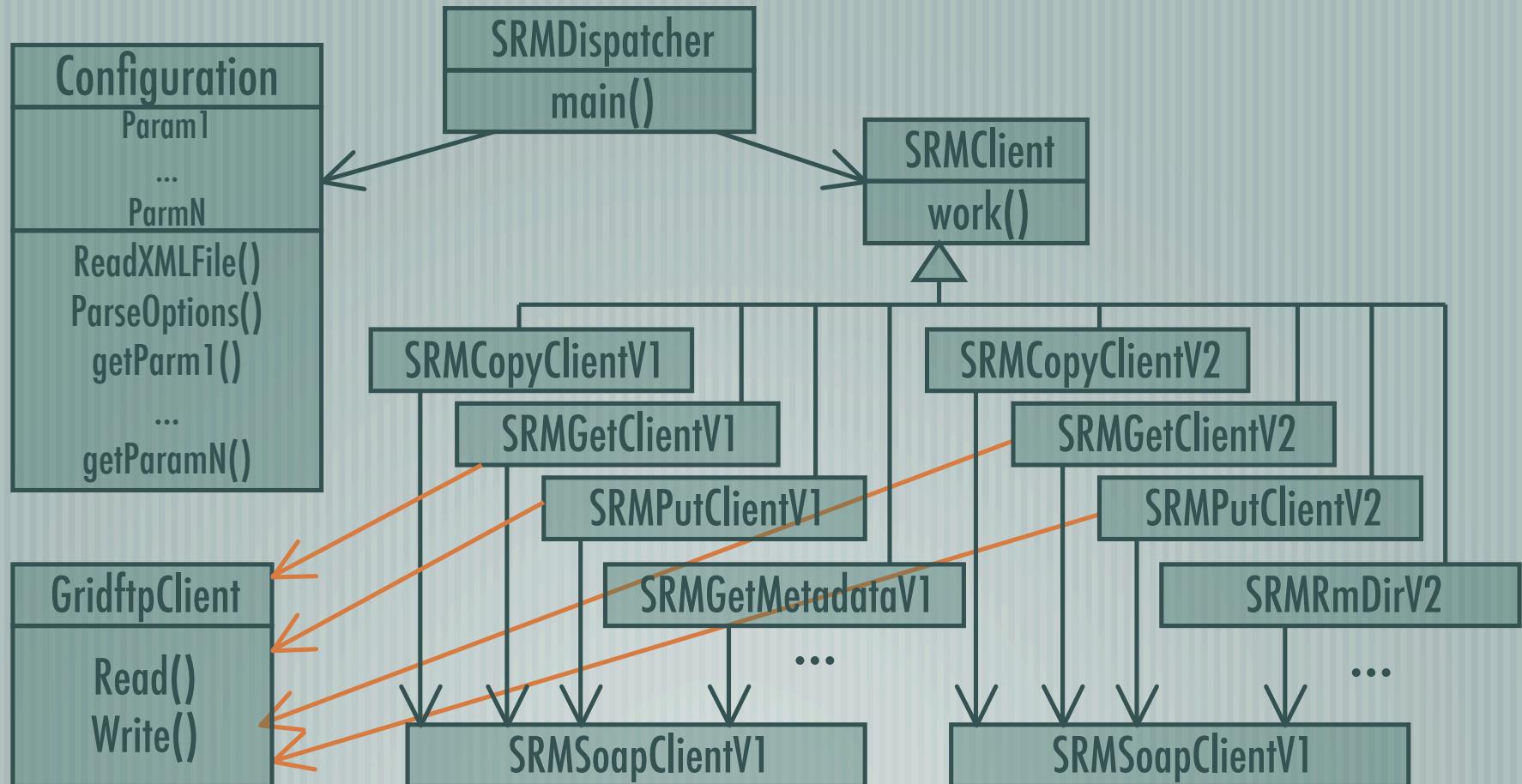


SRM Job State Transition Diagram





SRM Client Class Diagram .





Status of Fermilab SRM Implementation



— [SRM Interface to dCache Storage System

- Data Transfer Functions (get, put and copy)
- Load balancing, throttling, fairness
- Scalable replication mechanism via gridftp
- Automatic directory creation

— [Fault tolerance and reliability achieved by providing persistent storage for transfer requests and retries on failures

— [SRM interface as a standalone product, adaptable to work on top of another storage system through a SRM-Storage interface

— [A reference implementation of the SRM-Storage interface to a Unix File System

— [Implicit Space Management



Fermilab SRM Implementation Plans



- [Full implementation of SRM Version 2.1 interface
 - Data Transfer and directory functions - Jan 15th 2006
 - Explicit Space Management - March 15th 2006
 - Support for at least Volatile and Permanent space types
 - Directory and Permission functions
- [Research utilization of Lambda Station Interface by a Storage System. Lambda Station gives optical path allocation and per flow routing]
- [Monitoring, Administration and Accounting interfaces]



Resources



- [The Storage Resource Manager Collaboration, <http://sdm.lbl.gov/srm-wg>
- [Fermilab SRM Project , <http://srm.fnal.gov>
- [DCache, Disk Cache Mass Storage System, <http://www.dcache.org>